PATENT ABSTRACTS OF JAPAN

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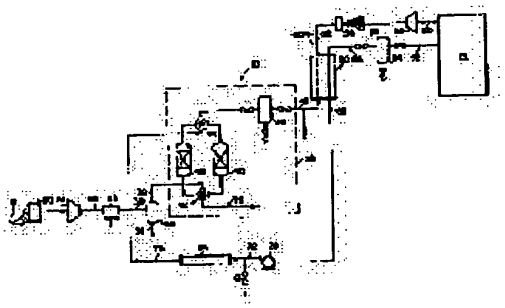
(54) METHOD FOR PRODUCING REFRIGERATING ATMOSPHERE AND DEVICE FOR COOLING ARTICLE TO TEMPERATURE OF-100° F (-73° C) OR BELOW

(57)Abstract:
PURPOSE: To suppress frosting of a freezer and also to prevent circulation of bacteria by a method wherein after the atmosphere is sucked in through a particulate filter and compressed, it is cooled down to remove moisture and gaseous contaminants, the compressed air is expanded to produce cold gas of very low temperature and it is introduced into an adiabatic closed space.
CONSTITUTION: In a device for cooling an adiabatic closed space 14 of a foodstuff freezer, a filter 20 which can filter particulate substances is provided and the air passing through this filter 20 is compressed by a multistage compressor 24. The air of high temperature and high pressure coming out from the compressor 24 is cooled down to the vicinity of an ambient temperature by a cooler 28 and then introduced into a separator 24 to separate and remove water therefrom and then it is led to a turbo expansion unit 58 via vessels 39 and 40 holding molecular sieves for removing moisture and gaseous contaminants, a particulate trap 46, a heat exchanger 50 and a particulate strainer 54. The cooled gas produced in the turbo expansion unit is supplied to the adiabatic closed space 14 to refrigerate foodstuff. The air in the adiabatic closed space 14 is circulated through a particulate filter 64, the heat exchanger 50, a blower 70 and a sterilizing unit 74.



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CLAIMS

[Claim(s)]
[Claim 1] Process which it is [process] the approach of generating a frozen ambient atmosphere, and passes a particle filter for the flow of perimeter [-] air inside closing space;
- Process which compresses the flow of the aforementioned filtration air and is made into high pressure and an elevated temperature;
- Process which cools the flow of the aforementioned compressed air to the temperature of a perimeter environment, and approximate temperature;
- Process which maintains almost same temperature and pressure of flow of said air while removing moisture and gaseous contaminants from the flow of said compressed air;
- Process which cools the flow of the aforementioned compressed air and is made into the temperature of 0 degree F (-17.8 degrees C);
- Process made into the pressure which the flow of the aforementioned compressed air is expanded and exceeds it more slightly than very low temperature temperature and very low temperature atmospheric pressure;
- Process which introduces the flow of the aforementioned air into said closing space by very low temperature;
- Process which does not make said air reintroduce into said heat insulation space although it removes after carrying out warming of the air by contacting said air from said closing space, and goods are cooled in such closing space or closing space is cooled;
since — the approach of the becoming frozen ambient atmosphere generation.
[Claim 2] The approach of claim 1 characterized by making it expand by the heat exchange contacted to the low-temperature air sampled from said closing space after cooling said compressed-air flow.
[Claim 3] The approach of claim 2 characterized by applying to the heat exchange contacted with the flow of said compressed air after putting said sampling air to ice and applying to particle removal.
[Claim 4] The approach of claim 2 characterized by sterilizing said sampling air after heat exchange, and using it for playback of the equipment used for said moisture and a gaseous-contaminants removal process.
[Claim 5] The approach of claim 1 characterized by making it expand after applying the flow of said cooling compressed air to a particle removal process.
[Claim 6] the equipment which cools goods to the temperature below -100 degrees F (-73 degrees C) -- it is - the heat insulation means and; which put in the environment which consists of said goods cooled and air cooled by the temperature below -100 degrees F (-73 degrees C)
- Means which stabilizes the flow of filtration air at ambient pressure and temperature;
- A means to cool the flow of the aforementioned compressed air to the temperature near [without loss of a pressure] ambient temperature;
- A means to stop pressure loss to the minimum and to remove moisture, gaseous contaminants, and a particle from said compressed-air flow;
- A means to cool the aforementioned compressed-air flow to the temperature below 0 degree F (-17.8 degrees C);
- A means to filter a particle from the flow of said cooling compressed air;
- Means made into the pressure which the flow of the aforementioned cooling compressed air is expanded and exceeds a little temperature of -100 degrees F (-73 degrees C), and ambient pressure;
- A means to introduce the flow of the aforementioned expansion air into said heat insulation means;
- A means to remove after contacting low-temperature air on said goods from said heat insulation means and cooling goods;
Equipment of goods cooling which consists of ********.
[Claim 7] Equipment of claim 6 with which a means to cool said compressed-air flow is characterized by the heat exchanger and removing low-temperature air from said heat insulation means, and using it for cooling of said compressed-air flow by said heat exchanger.
[Claim 8] Equipment of claim 7 characterized by providing a means by which said equipment introduces said air into said heat exchanger after removing an ice particle from said air removed from said heat insulation means.
[Claim 9] Equipment of claim 6 characterized by said heat insulation space being the freezer compartment of a spiral, collision uptake, or a tunnel bottom.
[Claim 10] Equipment of claim 6 characterized by being the multistage compressor with which said means to compress said flow is really which activates said expansion machine equipped with a gear transmission.
[Claim 11] Equipment of claim 6 characterized by being the pressure fluctuation adsorption unit with which a means

to remove moisture and gaseous contaminants from said compressed-air flow is equipped with the particle trap which cools a particle after removal of moisture and gaseous contaminants from said compressed-air flow.
[Claim 12] Equipment of claim 7 with which said equipment uses a means to sterilize the air removed from said heat insulation means after heat exchange, and said air, at an elevated temperature, reproduces said means, and is characterized by providing moisture and a means to remove gaseous contaminants from said compressed-air flow.
[Claim 13] Equipment of claim 12 characterized by providing the blower which is made to pass said means for said air compulsorily at an elevated temperature, and removes moisture and gaseous contaminants from said compressed-air flow.
[Claim 14] Equipment of claim 6 characterized by being the compressor with which said means to compress the flow of said air does not use petroleum.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Said cooling air is especially used for the installation to goods, for example, the freezer for quick-freezing of food, about the approach and equipment with which this invention cools air to very low temperature.
[0002]
[Description of the Prior Art] U.S. Pat. No. 4,315,409 and No. 4,317,665 are indicating amelioration of a very-low-temperature freezer using air by very low temperature which is indicated by U.S. Pat. No. 3,733,848 and No. 3,868,827. If the air taken from the air which surrounds, the equipment, for example, the food freezer, cooled, is cooled in temperature of -180 degrees C or less and it introduces into a freezer at this temperature, quick-freezing of goods will enable it for this freezer to perform with the equipment of the above-mentioned United States patent. In the food industry, such a freezer carries out food refrigeration and finds the directions to preservation and loading of food.
[0003]
[Problem(s) to be Solved by the Invention] After the advanced technology samples a part of refrigeration by repressing and expansion, it depends for it on recycling from a freezer compartment, and it is making this low temperature attain surely. The problem which arises in because of that of said recycling equipment is concentrated on the fact that the U.S. federal government needs perfect cleaning and the environmental sanitation of this kind of equipment. Generally the disconnection for cleaning is not easy for the recycling equipment systematized by the equipment which is equipped with the thing of large-sized equipment, for example, a compressor and of the same kind [other], and takes the air from ambient temperature to the temperature of -180 degrees C (about -117.8 degrees C). Therefore, since such equipment reuses atmospheric air continuously, it tends to cause recycling of adhesion of frost, and a bacteria particle and the particle of frost.
[0004] This invention relates to use of the gas super-low warm air refrigerating cycle which generates low-temperature air very much according to a series of intercooling processes of a compressor and a turbo expansion machine. Quick-freezing of goods which supplied said low temperature gas to the heat insulation closing container, and is contained inside said closing container is attained. First, the food with which the usual very-low-temperature food freezer is sufficient as such a closing container with food, and it is frozen is [about]. -It is contacted with air at the temperature of 200 degrees F (about -129 degrees C). If the air which was sampled from said heat insulation room, or came out goes into said equipment and heat exchange is carried out to the air cooled, it will be used for the expansion after being poured into said heat insulation room. After carrying out warming of the sampling air to an elevated temperature, reproducing equipment and removing moisture and gaseous contaminants from compressed-air flow, it is made to cool and expand. After applying a part of sampling air to sterilization, it uses for playback, and it discharges to atmospheric air after that. Thus, this approach of this invention prevents generating of the problem of advanced-technology equipment, without depending on recycling of air.
[0005]
[Means for Solving the Problem] The 1st embodiment of this invention is a process which it is [process] the approach of generating a frozen ambient atmosphere, and passes a particle filter for the flow of perimeter [-] air inside closing space.;
- Process which compresses the flow of the aforementioned filtration air and is made into high pressure and an elevated temperature;
- Process which cools the flow of the aforementioned compressed air to the temperature of a perimeter environment, and approximate temperature;
- Process which maintains almost same temperature and pressure of flow of said air while removing moisture and gaseous contaminants from the flow of said compressed air;
- Process which cools the flow of the aforementioned compressed air and is made into the temperature of 0 degree F (-17.8 degrees C);
- Process made into the pressure which the flow of the aforementioned compressed air is expanded and exceeds it more slightly than very low temperature temperature and very low temperature atmospheric pressure;
- Process which introduces the flow of the aforementioned air into said closing space by very low temperature;
- Process which does not make said air reintroduce into said heat insulation space although it removes after carrying out warming of the air by contacting said air from said closing space, and goods are cooled in such closing

space or closing space is cooled;
since -- let the approach of the becoming frozen ambient atmosphere generation be a summary.
[0006] the equipment with which the 2nd embodiment of this invention cools goods to the temperature below -100 degrees F (-73 degrees C) -- it is - the heat insulation means and; which put in the environment which consists of said goods cooled and air cooled by the temperature below -100 degrees F (-73 degrees C)
- Means which stabilizes the flow of filtration air at ambient pressure and temperature;
- A means to cool the flow of the aforementioned compressed air to the temperature near [without loss of a pressure] ambient temperature;
- A means to stop pressure loss to the minimum and to remove moisture, gaseous contaminants, and a particle from said compressed-air flow;
- A means to cool the aforementioned compressed-air flow to the temperature below 0 degree F (-17.8 degrees C);
- A means to filter a particle from the flow of said cooling compressed air;
- Means made into the pressure which the flow of the aforementioned cooling compressed air is expanded and exceeds a little temperature of -100 degrees F (-73 degrees C), and ambient pressure;
- A means to introduce the flow of the aforementioned expansion air into said heat insulation means;
- A means to remove after contacting low-temperature air on said goods from said heat insulation means and cooling goods;
Let the equipment of goods cooling which consists of ******** be a summary.
[0007]
[Function] At the temperature generated by the mechanical-refrigeration machine which uses chlorofluorocarbon or ammonia as a refrigerant, one of the important problems which freeze food using a mechanical-refrigeration machine has especially received loss of intense dehydration, and flavor and quality, when ultimate consumers use food, the goods frozen and. A mechanical-refrigeration machine is [about]. -Low-temperature air is generable at the temperature of 35 degrees F (about -37 degrees C). By common knowledge, the very-low-temperature food freezer using liquid hydrogen is useful to prevention of superfluous dehydration. However, the very-low-temperature food freezer using the super-freezing mixture, for example, the nitrogen, or the carbon dioxides other than air is expensive, and, moreover, has the problem of insurance discharge of evaporation super-freezing mixture of the inside of a freezer, and a perimeter.
[0008] Use of air is possible for the approach and equipment by this invention, moreover, the amount of frost of a freezer is reduced using very-low-temperature refrigeration of advanced-technology equipment, reduction of maintenance time and costs can be performed, and the additional advantage which can improve environmental sanitation according to the fact of using air with a true open cycle configuration, further can attain all the effectiveness and product article progression in quality.
[0009]
[Example] Equipment 10 is equipped with the heat insulation closing space 14 with reference to drawing 1 . The heat insulation closing space 14 shows well-known swirl, collision uptake type, or tunnel-type the freezer for usual form food technically especially. The flow 16 of the air which passes along the flow 16 of the air which an average diameter filters 98% or more of a particulate matter with a magnitude of 20 microns or more for the heat insulation closing space shown by 14, and passes last kind of particle air filter 20 is taken in, and it cools. Filtration air is led to a multistage compressor 24 via a conduit 22. The range of the temperature of intake air is about 25 degrees F (-6.7 degrees C) thru/or 105 degrees F (about 40.5 degrees C), and pressures are 14.1psia(s) (97.21Kpa). A compressor 24 is equipped with intercooling with a multistage (for example, four steps) compressor, and the air in a conduit 26 comes out of said compressor at about 198 psia(s) (1365. 01Kpa) and the temperature of about 200 degrees F (93 degrees C). the ** which a conduit 26 leads said compression and heating air to an aftercooler 28, and does not bring about loss of a pressure for said compressed air -- the inside of **10 degrees F (about -12.2 degrees C) of ambient temperature -- cooling -- a conduit -- it leads to an eliminator 32 by 30 course, and water is removed from compressed-air flow. The water from an eliminator can perform well-known processing technically via a conduit 34. said compressed-air flow -- the conduit from an eliminator 32 -- it puts into the box 38 possessing at least two containers 39 and 40 into which molecular sieving for removal of an ingredient, for example, moisture, and gaseous contaminants was put for these components led to 36 course, and an oven / particle removal ******, and schematic drawing shows. It is removable besides the last amount by the class situation of an ingredient included in said containers 39 and 40, the gaseous contaminants, for example, the carbon dioxide, of a steam. The closing motion valves 42 and 44 required for said equipment 38 have, and said containers 39 and 40 become on stream [common knowledge] technically, or it enables it to reproduce. Moreover, said oven and particle removal collection equipment 38 are equipped with the particle trap 46, and few stealing-off screen ingredient or other particulate matters in said compressed-air flow are removed. It is [about] so that compressed-air flow may be led to a heat exchanger 50 via a conduit 48 from said trap 46 and pressure loss may stop compressed-air flow at very few amounts. -It cools in temperature of 90 degrees F (-68 degrees C). Said cooling compressed-air flow is led to a conduit 56 through the particle strainer 54 via a conduit 52 from said heat exchanger 50, and it introduces into the turbo expansion machine 58. Protection of said turbo expansion machine is equipped with said particle strainer 54. said coolant gas flow -- said turbo expansion machine 58 -- a conduit -- it goes 60 times, comes out by the temperature of about 250 degrees F (-157 degrees C), and the pressure of 15.2psia(s) (104.79Kpa), and is poured into said heat insulation space 14, cooling refrigeration space is generated, and the goods which are contained in it are cooled or frozen. Since it is in [all] a ********* freezer, the air which threw away all or a part of the frozen

capacity is sampled via a conduit 62 from said heat insulation space. It puts into ice and the particle filter 64. To a heat exchanger 50 with a conduit 66 Through, About -The air which goes into a heat exchanger by the temperature of 100 degrees F (-73 degrees C) and the pressure of 14.7psia(s) (97.21Kpa) comes out of said heat exchanger 50, and goes into a conduit 68 at the pressure of about 13.3 psia(s) (91.69Kpa), and the temperature of 90 degrees F (32.2 degrees C). It is introduced into a blower 70 and comes out of said blower 70, and said warming sampling gas flow included in a conduit 68 passes along a conduit 72, is introduced into a sterilizer 74, for example, an ultraviolet-rays sterilizer, comes out of said sterilizer 74, it passes along a conduit 76 and comes out of said equipment through a conduit 78 after that. As another example, sampling air can also be discharged via a conduit 78 from said equipment. Although recycling of the sampling air is never carried out to said equipment, since it is used, restricting to playback of the adsorber of equipment 38, therefore sampling air is sterilized, there is no contamination of arrival air and there is also no adhesion of ice in recirculating air. That is because ice and the particle filter 64 were passed.

[0010] Said compressor and expansion machine 58 are connected by preparing an auxiliary pinion in said compressor and attaching said expansion machine. It can operate with the 1500 horsepower induction motor of biaxial, and said compressor is applicable also to the drive of said vacuum blower 70. To said heat insulation container 14, although it is an exception, all equipments are attached on a skid and installation to the plant of existing which uses the freezer of other classes is made easy. It does not interfere, even if said last refrigerator 28 is closed-loop glycol radiator equipment, and it can be used not only for interstage cooling of the main air compressor 24 but for cooling of the discharge from the main air compressor. Said heat insulation container 14 can become a freezer, for example, a screw type food freezer.

[0011]

[Effect of the Invention] the above-mentioned explanation to air -- very low temperature -- generating -- cooling of a heat insulation container -- or refrigeration -- he can understand that degradation of dehydration in process and product quality can be used for implementation of the food refrigeration stopped to the minimum. The equipment of this invention prevents recycling of bacteria and a frost particle, and attains reduction of a stop, therefore maintenance expense, and amelioration of the environmental sanitation of equipment for frost of a freezer to the minimum.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] U.S. Pat. No. 4,315,409 and No. 4,317,665 are indicating amelioration of a very-low-temperature freezer using air by very low temperature which is indicated by U.S. Pat. No. 3,733,848 and No. 3,868,827. If the air taken from the air which surrounds, the equipment, for example, the food freezer, cooled, is cooled in temperature of -180 degrees C or less and it introduces into a freezer at this temperature, quick-freezing of goods will enable it for this freezer to perform with the equipment of the above-mentioned United States patent. In the food industry, such a freezer carries out food refrigeration and finds the directions to preservation and loading of food.

[Translation done.]

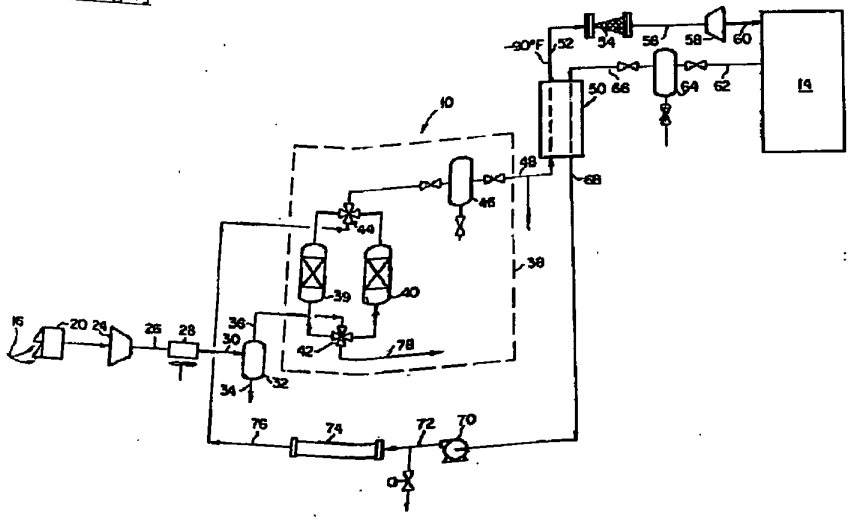
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic drawing of an approach and equipment by this invention.
[Description of Notations]
10 Equipment
14 Heat Insulation Closing Space
16 Flow of Air
20 Particle Air Filter
22 Conduit
24 Multistage Compressor
26 Conduit
28 Aftercooling
30 Conduit
32 Eliminator
34 Conduit
36 Conduit
38 Box (Equipment)
39 Container
40 Container
42 Closing Motion Valve
44 Closing Motion Valve
46 Particle Trap
48 Conduit
50 Heat Exchanger
52 Conduit
54 Particle Strainer
56 Conduit
58 Turbo Expansion Machine
60 Conduit
62 Conduit
64 Particle Filter
66 Conduit
68 Conduit
70 Blower
72 Conduit
74 Sterilizer
76 Conduit
78 Conduit

[Translation done.]

DRAWINGS

[Drawing 1]



[Translation done.]

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最終頁に続く

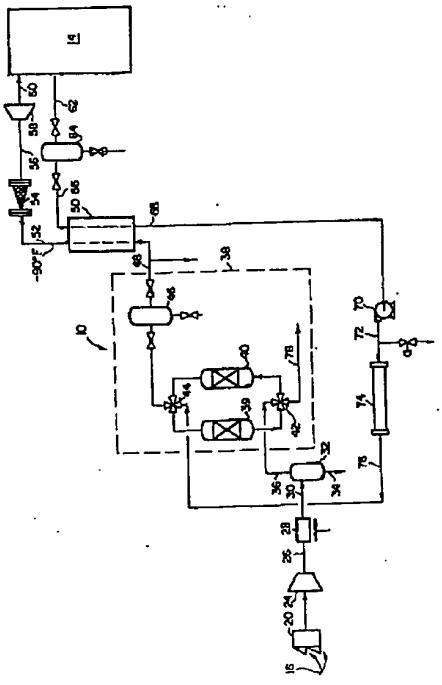
(54)【発明の名称】　冷凍雰囲気の生成法と物品の－100°Ｆ（－73℃）以下の温度への冷却装置

(57)【要約】

【目的】　従来の絶えず大気を再利用する装置が装置の着霜、細菌微粒子と霜微粒子の再循環を起こし易く、不衛生且つ設備が高価につく。

【構成】　食料のような物品を急速冷凍するため直接接触冷却の冷媒として空気を極低温（例えば－１００°Ｆ（－７３℃）以下に冷却して用いる方法と装置。

【効果】　冷凍工程中の脱水と製品品質の劣化と、フリーザーの着霜を最少限に止め、細菌の循環を防止、保全費の低減と装置の循環衛生に対する改良を達成できる



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【特許請求の範囲】

【請求項１】　閉鎖空間の内側に冷凍雰囲気を生成する方法であって、

・周囲空気の流れを微粒濾過器を通過させる工程と；

・前記濾過空気の流れを圧縮して高圧と高温にする工程と；

・前記圧縮空気の流れを周囲環境の温度と近似の温度に冷却する工程と；

・水分と気体汚染物を前記圧縮空気の流れから除去する一方、前記空気の流れのほぼ同一の温度と圧力を維持する工程と；

・前記圧縮空気の流れを冷却して０°Ｆ（－１７．８℃）の温度にする工程と；

・前記圧縮空気の流れを膨脹させて極低温の温度と大気圧より僅かに上回る圧力にする工程と；

・前記空気の流れを極低温で前記閉鎖空間に導入する工程と；

・空気を前記閉鎖空間から、前記空気を接触させることで熱入れしてから除去し、又物品をこのような閉鎖空間で冷却するかあるいは閉鎖空間を冷却するが、前記空気を前記断熱空間には再導入させない工程と；

からなる冷凍雰囲気生成の方法。

【請求項２】　前記圧縮空気流れを冷却してから前記閉鎖空間より抜取った低温空気に接触させる熱交換により膨脹させることを特徴とする請求項１の方法。

【請求項３】　前記抜取り空気を氷に曝し、微粒子除去にかけてから前記圧縮空気の流れに接触させる熱交換にかけることを特徴とする請求項２の方法。

【請求項４】　前記抜取り空気を熱交換の後滅菌して、前記水分と気体汚染物除去工程に用いられる装置の再生に使用することを特徴とする請求項２の方法。

【請求項５】　前記冷却圧縮空気の流れを微粒除去工程にかけてから膨脹させることを特徴とする請求項１の方法。

【請求項６】　物品を－１００°Ｆ（－７３℃）以下の温度に冷却する装置であって、

・冷却される前記物品と、－１００°Ｆ（－７３℃）以下の温度に冷却された空気からなる環境を入れる断熱手段と；

・濾過空気の流れを周囲圧力と温度で安定させる手段と；

・前記圧縮空気の流れを圧力の損失なしに周囲温度に近い温度に冷却する手段と；

・水分、気体汚染物と微粒子を前記圧縮空気流れから圧力損失を最少限に止めて除去する手段と；

・前記圧縮空気流れを０°Ｆ（－１７．８℃）以下の温度に冷却する手段と；

・微粒子を前記冷却圧縮空気の流れから濾過する手段と；

・前記冷却圧縮空気の流れを膨脹させて－１００°Ｆ

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（－７３℃）の温度と、周囲圧力を少々上回る圧力にする手段と；

・前記膨脹空気の流れを前記断熱手段に導入する手段と；

・低温空気を前記断熱手段から前記物品に接触させ、物品を冷却した後、除去する手段と；

の組合せからなる物品冷却の装置。

【請求項７】　前記圧縮空気流れを冷却する手段が熱交換器と、低温空気を前記断熱手段から除去して前記熱交換器で前記圧縮空気流れの冷却に用いることを特徴とする請求項６の装置。

【請求項８】　前記装置が、前記断熱手段から除去された前記空気から氷微粒子を除去してから前記空気を前記熱交換器に導入する手段を具備することを特徴とする請求項７の装置。

【請求項９】　前記断熱空間が螺旋、衝突捕集もしくはトンネル形の冷凍室であることを特徴とする請求項６の装置。

【請求項１０】　前記流れを圧縮する前記手段が前記膨脹器を活性化させる一体歯車伝動装置を備える多段圧縮機であることを特徴とする請求項６の装置。

【請求項１１】　前記圧縮空気流れから水分と気体汚染物を除去する手段が、前記圧縮空気流れから微粒子を水分と気体汚染物の除去後に冷却する微粒トラップを備える圧力変動吸着単位装置であることを特徴とする請求項６の装置。

【請求項１２】　前記装置が前記断熱手段から除去した空気を熱交換の後、滅菌する手段と、前記空気を高温で用いて前記手段を再生させ、水分と気体汚染物を前記圧縮空気流れから除去する手段とを具備することを特徴とする請求項７の装置。

【請求項１３】　前記空気を高温で前記手段を強制的に通過させ水分と気体汚染物を前記圧縮空気流れから除去する送風機を具備することを特徴とする請求項１２の装置。

【請求項１４】　前記空気の流れを圧縮する前記手段が石油を使用しない圧縮機であることを特徴とする請求項６の装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は空気を極低温に冷却する方法と装置に関し、前記冷却空気はとりわけ、物品例えば食料の急速冷凍用フリーザーへの導入に用いられる。

【０００２】

【従来の技術】米国特許第４，３１５，４０９号と第４，３１７，６６５号は、米国特許第３，７３３，８４８号と第３，８６８，８２７号に開示されているような極低温で空気を用いて極低温冷凍装置の改良を開示している。前述米国特許の装置では、冷却される装置例えば食料フリーザーを囲繞する空気から取った空気を－１８

０℃以下の温度に冷却して、この温度でフリーザーに導入すると、物品の急速冷凍がこのフリーザーで行えるようにする。このようなフリーザーは食品業界では食品冷凍して食品の保存ならびに船積にその利用法を見つける。

【０００３】

【発明が解決しようとする課題】先行技術は再圧縮と膨脹により冷凍の一部を抜き取った後、冷凍室からの再循環にたよってまさしくこの低温を達成させている。前記再循環装置のゆえに起こる問題は、米国連邦政府がこの種の装置の完全な掃除と環境衛生を必要とする事実に集中している。大型の装置例えば圧縮機その他同種類のものを備え、周囲温度から－１８０℃（約－１１７．８℃）の温度までの空気をとる装置に体系化された再循環装置は一般に掃除のための開放が容易ではない。従って、このような装置は、大気を絶えず再利用するので霜の付着、細菌微粒子と霜の微粒子の再循環を起こし易い。

【０００４】本発明は圧縮機とターボ膨脹器の一連の中間冷却工程によりガス状の非常に低温の空気を生成する極低温空気冷凍サイクルの利用に関するものである。前記低温ガスを断熱閉鎖容器に供給して前記閉鎖容器の内側に入っている物品の急速冷凍を達成する。まず、このような閉鎖容器が通常の極低温食料フリーザーでよく、冷凍される食料は約－２００°Ｆ（約－１２９℃）の温度で空気と接触される。前記断熱室より抜き取られるか、或いは出た空気は前記装置に入り、冷却される空気と熱交換されると、前記断熱室に注入された後の膨脹用に使用される。抜取空気を高温に熱入れして装置を再生して圧縮空気流れより水分と気体汚染物を除去してから冷却ならびに膨脹させる。抜取空気の一部を滅菌にかけてから再生に用い、その後大気に排出する。このようにして、本発明のこの方法は空気の再循環にたよることなく先行技術装置の問題の発生を防止する。

【０００５】

【課題を解決するための手段】本発明の第１の実施態様は、閉鎖空間の内側に冷凍雰囲気を生成する方法であって、

・周囲空気の流れを微粒濾過器を通過させる工程と；

・前記濾過空気の流れを圧縮して高圧と高温にする工程と；

・前記圧縮空気の流れを周囲環境の温度と近似の温度に冷却する工程と；

・水分と気体汚染物を前記圧縮空気の流れから除去する一方、前記空気の流れのほぼ同一の温度と圧力を維持する工程と；

・前記圧縮空気の流れを冷却して０°Ｆ（－１７．８℃）の温度にする工程と；

・前記圧縮空気の流れを膨脹させて極低温の温度と大気圧より僅かに上回る圧力にする工程と；

・前記空気の流れを極低温で前記閉鎖空間に導入する工程と；

・空気を前記閉鎖空間から、前記空気を接触させることで熱入れしてから除去し、又物品をこのような閉鎖空間で冷却するかあるいは閉鎖空間を冷却するが、前記空気を前記断熱空間には再導入させない工程と；

からなる冷凍雰囲気生成の方法を要旨とする。

【０００６】本発明の第２の実施態様は、物品を－１００°Ｆ（－７３℃）以下の温度に冷却する装置であって、

・冷却される前記物品と、－１００°Ｆ（－７３℃）以下の温度に冷却された空気からなる環境を入れる断熱手段と；

・濾過空気の流れを周囲圧力と温度で安定させる手段と；

・前記圧縮空気の流れを圧力の損失なしに周囲温度に近い温度に冷却する手段と；

・水分、気体汚染物と微粒子を前記圧縮空気流れから圧力損失を最少限に止めて除去する手段と；

・前記圧縮空気流れを０°Ｆ（－１７．８℃）以下の温度に冷却する手段と；

・微粒子を前記冷却圧縮空気の流れから濾過する手段と；

・前記冷却圧縮空気の流れを膨脹させて－１００°Ｆ（－７３℃）の温度と、周囲圧力を少々上回る圧力にする手段と；

・前記膨脹空気の流れを前記断熱手段に導入する手段と；

・低温空気を前記断熱手段から前記物品に接触させ、物品を冷却した後、除去する手段と；

の組合せからなる物品冷却の装置を要旨とする。

【０００７】

【作用】機械冷凍機を用い食料を冷凍する重要な問題の１つは、クロロフルオロカーボンもしくはアンモニアを冷媒として用いる機械冷凍機に生成される温度では、冷凍される物品、とりわけ食料は、最終消費者が使用する時には、激しい脱水と、風味と品質の損失を受けている。機械冷凍機はほぼ－３５°Ｆ（約－３７℃）の温度で低温空気を生成できる。液体水素を用いる極低温食料フリーザーは周知で、過剰脱水の防止に役立つ。しかし、空気以外の超寒剤例えば窒素もしくは二酸化炭素を用いる極低温食料フリーザーは高価で、しかも冷凍装置内及び周囲の気化超寒剤の安全排出の問題を抱えている。

【０００８】本発明による方法と装置は、空気の使用が可能で、先行技術装置の極低温冷凍を用い、しかもフリーザーの着霜量を減らし、保全時間と費用の低減ができ、更に、空気を真の開放サイクル構成で使用するという事実により環境衛生を改善できる付加的利点により効率及び製品品質の向上のすべてを達成できる。

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【0009】

【実施例】図1を参照して、装置10は断熱閉鎖空間14を備える。断熱閉鎖空間14は特に技術上周知の螺旋状、衝突捕集式或いはトンネル式の通常形食料用フリーザーを示す。14で示された断熱閉鎖空間を、平均直径が20ミクロン以上の大きさの粒状物質の98%以上を濾過し去る種類の微粒空気濾過機20を通過する空気の流れ16を通る空気の流れ16を取入れて冷却する。濾過空気を導管22を経由して多段圧縮機24に導く。吸込空気の温度はほぼ25°F（－6.7℃）乃至105°F（約40.5℃）の範囲で、圧力は14.1psia（97.21Kpa）である。圧縮機24は多段（例えば4段）圧縮機で中間冷却を備えて、導管26にある空気がほぼ198psia（1365.01Kpa）、そしてほぼ200°F（93℃）の温度で前記圧縮機を出るようにする。導管26は前記圧縮、加熱空気を最終冷却器28に導き、前記圧縮空気を圧力の損失をもたらさずに周囲温度の±10°F（約－12.2℃）内に冷却して、導管30経由で分離器32に導き、水を圧縮空気流れから除去する。分離器からの水は導管34を経由して、技術上周知の処理ができる。前記圧縮空気流れを分離器32から導管36経由、乾燥器／微粒除去修正装に導くこれらの部品を、材料例えば水分と気体汚染物の除去用分子篩を入れた少くとも2つの容器39と40を具備する箱38に入れて略図で示す。前記容器39、40に入っている材料の種類いかんで、水蒸気の最終量のほかに、気体汚染物例えば二酸化炭素も除去できる。前記装置38に必要な開閉弁42、44が備えて、前記容器39と40が技術上周知のオンストリームになるか、再生できるようにする。又前記乾燥器・微粒除去集成装置38に微粒トラップ46を備えて、前記圧縮空気流れ中のわずかな持逃げ篩材料もしくは他の粒状物質を除去する。圧縮空気流れを前記トラップ46から導管48を経由して熱交換器50に導き、圧縮空気流れを圧力損失が極めて僅かな量に止まるよう、ほぼ－90°F（－68℃）の温度に冷却する。前記冷却圧縮空気流れを前記熱交換器50から導管52を経由して微粒ストレーナ54を通して導管56に導き、ターボ膨張器58に導入する。前記微粒ストレーナ54は前記ターボ膨張器の保護用に備わっている。前記冷却ガス流れは前記ターボ膨張器58を導管60経由して約250°F（－157℃）の温度と15.2psia（104.79Kpa）の圧力で出て前記断熱空間14に注入され、冷却冷凍空間を生成して、その中に入っている物品を冷却又は冷凍する。全均合流量冷凍装置内にあるので、その冷凍容量の全部又は一部を捨てた空気を前記断熱空間から導管62を経由して抜取り、氷と粒子濾過器64に入れ、導管66で熱交換器50に通し、約－100°F（－73℃）の温度と14.7psia（97.21Kpa）の圧力で熱交換器に入る空気は前記熱交換器50を出て導管68にほぼ13.3psia（91.69Kpa）の圧力と90°F（32.2℃）の温度で入る。導管68に入った前記熱入れ抜取りガス流れは送風機70に導入され、前記送風機70を出て導管72を通り、滅菌器74例えば紫外線滅菌器に導入され、前記滅菌器74を出て導管76を通り、その後、導管78を通って前記装置を出る。別の例として、抜取り空気は前記装置から導管78を経由して排出することもできる。抜取り空気は決して前記装置に再循環されないが、装置38の吸着装置の再生に限り使用され、従って、抜取り空気を滅菌してあるので到来空気の汚染はなく、又再循環空気に氷の付着もない。それは氷と微粒濾過機64を通過させたからである。

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【0010】前記圧縮機と膨脹器58は、前記圧縮機に補助ビニオンを設けて前記膨脹器を取付けることで連結される。前記圧縮機は2軸1500馬力誘導電動機により運転でき、又前記真空送風機70の駆動にも利用できる。前記断熱容器14に対しては例外であるが、全装置をスキッド上に取付けて、他の種類の冷凍装置を用いている現存のプラントへの設置を容易にする。前記最終冷凍機28が閉ループグリコールラジエータ装置であっても差支えなく、主空気圧縮機24の段間冷却のみならず主空気圧縮機からの吐出しの冷却にも使用できる。前記断熱容器14がフリーザー、例えば螺旋形食料フリーザーとなりうる。

【0011】

【発明の効果】前述の説明から、空気を極低温を生成して、断熱容器の冷却に、或いは冷凍工程中の脱水と製品品質の劣化を最少限に止める食料冷凍の実施に利用できることが理解できる。本発明の装置は細菌と霜微粒子の再循環を防止し、フリーザーの着霜を最少限に止め、従って保全費の低減と装置の環境衛生の改良を達成する。

【図面の簡単な説明】

【図1】本発明による方法と装置の略図である。

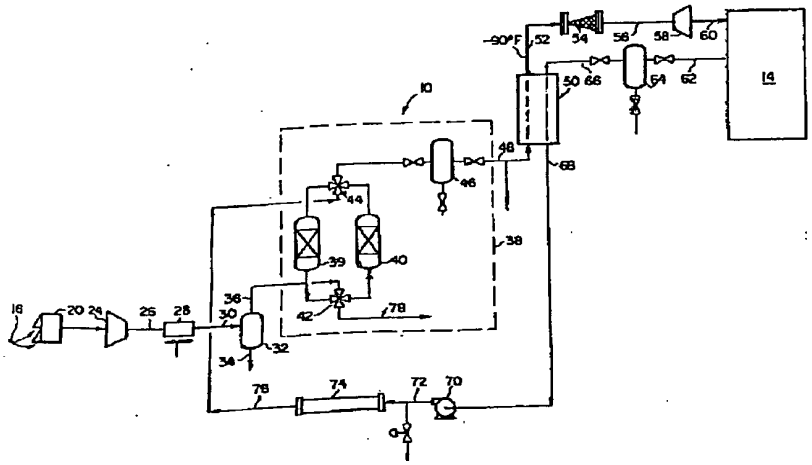
【符号の説明】

10　装置
14　断熱閉鎖空間
16　空気の流れ
20　微粒空気濾過器
22　導管
24　多段圧縮機
26　導管
28　最終冷却
30　導管
32　分離器
34　導管
36　導管
38　箱（装置）
39　容器
40　容器

7　　8

４２　開閉弁
４４　開閉弁
４６　微粒トラップ
４８　導管
５０　熱交換器
５２　導管
５４　微粒ストレーナ
５６　導管
５８　ターボ膨脹器
６０　導管
＊６２　導管
６４　微粒子濾過器
６６　導管
６８　導管
７０　送風機
７２　導管
７４　滅菌器
７６　導管
７８　導管
＊10

【図１】



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